December 3, 2001

Hecla
MINING COMPANY

MEMORANDUM TO: Randall Breedon – USEPA Region VIII

COPIES TO: file
John Galbavy, Esq.

FROM: Chris Gypton

SUBJECT: **Results of October 2001 investigations; Apex Site Pond 2 Soils Sampling and Analysis**

Introduction

This memorandum summarizes the activities and results of investigations at Hecla Mining Company's Apex Site described in the "Soil Sampling and Analysis Work Plan", dated August 30, 2001, and submitted to USEPA Region VIII. In general, the goal of the investigations was to assess the extent of and potential for seepage migration from Pond 2. Detailed discussion of the Apex Site's background, along with the proposed sampling and analysis activities, are found in the Work Plan and will not be re-iterated in this memo.

The Work Plan was approved by USEPA Region VIII on September 21, 2001. Site investigations were started on October 1, 2001 and completed on October 3rd. All laboratory testing was completed by November 16, 2001.

Field Investigations

The field investigations were supervised by Chris Gypton (Hecla Mining Company). Sampling and geotechnical logging was done by Doug Gibbs, P.E. (Monster Engineering), under contract with Hecla. USEPA Region VIII was represented by Janice Pearson (Project Coordinator) and Randall Breedon (Hydrologist).

All sampling was done with a conventional truck mounted drilling rig, using hollow flight augers and dry core, shelby tube or split spoon type samplers. Hecla retained RC Exploration Drilling, Inc. to provide the drilling services.

The Work Plan envisioned three (3) boreholes inside Pond 2 and one (1) borehole outside the impoundment, adjacent to the existing evaporation ponds. After review of drilling conditions and productivity, and discussion with USEPA, Hecla agreed to drill three (3) additional holes inside and one (1) additional hole outside Pond 2. The approximate locations of the boreholes are shown on Attachment B. Copies of the borehole logs are included in Attachment C. Representative samples of the recovered core were taken after logging. The Table 1 summarizes the boreholes, sample intervals and ID numbers:

TABLE 1
Borehole and Sample ID's

Borehole No.	Sample Interval	Sample ID	Remarks
1001-1	5.0 to 7.0 ft	1	Shelby tube
1001-1	8.5 to 9.0 ft	2	
1001-2	5.5 ft	3	
1001-3	5.5 to 6.0 ft	4	
1001-3	6.5 to 7.0 ft	5	
1001-4	n/a	n/a	No samples taken; refer to logs
1001-5	6.0 to 6.5 ft	6	
1001-6	6.5 to 7.0 ft	7	
1001-7	8.0 to 9.0 ft	8	
1001-8	19.0 ft	9	
1001-8	24.0 ft	10	
1001-8	25.0 ft	11	
1001-8	26.0 ft	12	

(For reference, boreholes 1001-1 through 1001-4 were proposed in the Work Plan)

Lab Testing

The laboratory tests described in the Work Plan focused on determining the basic geotechnical properties of the material contained in Pond 2 to aid in the scope definition of the final reclamation plan. Hecla retained Strata, Inc. to provide the testing services. The proposed tests and their ASTM standard designations are listed on Table 2.

TABLE 2
Laboratory Geotechnical Tests

Test	ASTM Standard
Sieve Analysis	ASTM C-136
Solids Specific Gravity	ASTM D-854
Moisture Content	ASTM D-2116
In-place Dry Density	ASTM D-2937
Atterberg Limits (LL + PL)	ASTM D-4318
Permeability (Falling Head)	ASTM D-5856
Consolidation	ASTM D-2435

The specific tests designated for each sample were determined in the field based on available sample size and condition at time of collection and receipt at the lab. Consolidation tests were not run on any samples due to recovery difficulties with the Shelby tube. Only one permeability test was run on a re-molded specimen from borehole 1001-1, Sample No. 1.

During the field investigations USEPA suggested it would be beneficial if the magnitude of the moisture retaining capability of the sediments underlying Pond 2 was known. Samples 9 through 12 from borehole 1001-8 were designated to be tested for this property. Based on input from USEPA and discussions with Strata, Hecla specified ASTM D-3152, Capillary Moisture Relationship Test for Fine Texture Soils for these samples. The results of these tests were inconclusive.

The lab test results are included in Attachment D.

Data Interpretation

The primary objective of the field investigations was to determine the extent of and potential for seepage migration from the impoundment. Based on observations during the sampling of boreholes 1001-4 and 1001-8, no evidence of seepage migration into the soil could be identified. The evidence from borehole 1001-4 is particularly compelling, as this hole was drilled adjacent to the active seep (refer to Figure 1 in Attachment B). The precipitated salts left by the seepage in the evaporation ponds are distinctly different in color than the native soils. No evidence of these salts was noted at any interval in the borehole. Therefore, the absence of precipitated salts indicates there has not been any seepage outside of the impoundment.

The logs for boreholes 1001-4 and 1001-8 indicate there is 10 to 18 feet of alluvial material immediately underlying the impoundment. Beneath this zone is a layer of weathered bedrock, containing silts and clays, that is at least 10 to 15 feet thick. Drilling through this zone became more difficult with depth. At refusal the blow count exceeded 50 per foot, however the bottom of the weathered bedrock zone had not been reached. Groundwater at the site is reported to be found in fractured sedimentary rocks at a depth of 160 to 300 feet below the surface. This weathered zone provides a barrier to the migration of both surface water and potential seepage from the impoundment to groundwater.

The material inside the impoundment is very heterogeneous. Field observations of the borehole samples indicate the texture, plasticity and amount of free liquid varies throughout the impoundment. The lab tests confirm the field observations. The moisture content of the material tends to increase with depth. The unlined lift of the impoundment dike is approximately 5 feet high. The moisture content of the samples taken at a depth of 5 to 8 feet below the impoundment surface ranged from 20 to 114 percent. Figure 2, in Attachment B, graphically depicts the spatial arrangement of the moisture content.

The field observations also indicated no direct relationship between the presence of free liquid and moisture content in the samples. Liquid oozed from the samples taken from boreholes 1001-1 and 1001-2, which had moisture contents of 107 percent and 43.4 percent respectively. The samples taken from boreholes 1001-5 and 1001-6 exhibited no free liquid, even though the moisture contents were 103.9 percent and 114.0 percent. The samples closest to the seeps (boreholes 1001-2 and 1001-7) had the lowest moisture content values. The material in this area is relatively coarser than the rest of the impoundment, and is likely to be more permeable.

One permeability test was run on a remolded sample from borehole 1001-1. At an estimated in-place dry density of 43 pounds per cubic foot the permeability was 3.7×10^{-6} cm/sec, indicating seepage though this material would be very low. However, the lab noted a decrease in moisture content after completing the test, and believed the sample consolidated during testing. Therefore, the actual permeability is likely to be higher than indicated.

The field observations and lab tests are insufficient to quantify the amount of free liquid that may be expressed from the tailings, and potentially flow through the dike at the southwest seep. The observed seepage rate appeared to be less than 0.2 gallons per minute.

Conceptual Dewatering Plan

Removal of the remaining free water that could seep through the unlined lift of the impoundment dike is an essential step towards final closure of Pond 2. Based on discussions with USEPA and accounting for site conditions, the following design criteria were identified:

1. The system should be passive; and rely on gravity to convey seepage flows.
2. The existing evaporation ponds will be incorporated into the system.
3. The consolidation rate of the tailings should be increased to draw off the remaining free water faster.

A limited network of perforated drainage pipes installed in the southwest quadrant of Pond 2 will meet criteria 1 and 2. The piping would be installed at the elevation of the top of the lined portion of the dike and slope towards the evaporation ponds. Pipe spaced should be about 20 feet on center along the length of the active seep. This equates to 6 or 7 runs of pipe. The installation could be done by either trenching or using a horizontal boring machine. Selection of the installation method will be based on ease of construction, worker safety and environmental protection. The apparent low seepage rate (< 0.2 gallons per minute) will not require large diameter pipe, therefore pipe sizing will be based on ease of handling and the structural requirements of the installation method.

Criteria 3 would be met by dumping piles of clean fill over the southwest one quarter to one third of the impoundment. This would put a surcharge on the tailings and increase the rate of consolidation. The fill material would later be incorporated into the final reclamation cover. Field observations indicate it will not be necessary to surcharge the entire impoundment as the tailings in the north half are very fine and exhibited no seepage even though the moisture content was in excess of 100 percent.

The overall time frame for dewatering cannot be determined at this time. Hecla believes additional testing is unlikely to economically provide a reasonable estimate. In lieu of additional testing, it is proposed that the design of the dewatering system be completed and the overall plan implemented. The flow rate from the drainage pipes can be measured periodically during the normal inspections of the evaporation ponds. USEPA and Hecla can then mutually agree to the flow rate that indicates the dewatering process is effectively complete.

Conceptually, the plan is composed of the following tasks, in relative order:

1. Evaluation of installation alternatives, and selection of the proposed alternative.
2. System component sizing and layout.
3. Evaluation of modifications to the existing evaporation ponds, if deem necessary.
4. Topographic survey of the impoundment, including establishing reference benchmarks.
5. Revisions to the existing inspection plan
6. Submittal of a design report to USEPA for review and/or approval
7. Procurement of materials and construction services
8. System installation, including placing of the surcharge fill material
9. Submittal of an as-built report to USEPA.
10. On-going monitoring during the dewatering phase.

Development of the final reclamation plan and designs will proceed after installation of the dewatering system, at a time mutually agreed to by USEPA and Hecla.

Attachments

A. Daily Activity Reports
B. Borehole Locations
C. Drilling Logs
D. Geotechnical Lab Test Results

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DAILY CONSTRUCTION ACTIVITY REPORT

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
CLIENT HECLA
LOCATION ST. GEORGE / APEX-OMG
DAILY REPORT NUMBER 1 SHEET 1 OF 1
DATE OCTOBER 1, 2001

TO CHRIS GYPTON, HECLA MINING CO.

WEATHER CLEAR, HOT, DRY, SLIGHT BREEZE IN AM, BREEZE, HOT CLEAR PM (92-98°)

CONTRACTOR'S EQUIPMENT

CONSTRUCTION ACTIVITIES 10 AM: MEET PENNY BASSET @ SITE, TOUR POND SITE & DISCUSS ACCESS, DRILL LOCATIONS, SITE SPECIFIC HAZARDS / SAFETY

2 30 PM DRILLERS ON-SITE. MT, DISCUSS H & S., SITE SPECIFIC COVERED, HAZWOPPER OK'D.

2:00 - 4:00 EPA REP'S ON-SITE, RANDY & JANICE, TOUR SITE, DISCUSS HOLE LOCATIONS. RANDY REQUESTS CHANGE OF HOLE #4 TO UPGRADIENT SIDE OF POND NEAR SUMPS. APPROVED BY CHRIS.

ALL LEAVE SITE ~ 4PM

VERBAL COMMUNICATION WITH CONTRACTOR, ENGINEER, DESIGNER, OWNER

Douglas O. Gibbs
FIELD REPRESENTATIVE

APPROVED BY

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DAILY CONSTRUCTION ACTIVITY REPORT

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
CLIENT HECLA
LOCATION ST. GEORGE / APEX-OMG
DAILY REPORT NUMBER 2 SHEET 1 OF 1
DATE OCTOBER 2, 2001

TO CHRIS GYPTON, HECLA MINING CO.

WEATHER PART. CLOUDY (5%), WARM 75° AM, PARTLY CLOUDY (10%), HOT, 92° PM

CONTRACTOR'S EQUIPMENT DIEDRICH D-120 HOLLOW STEM AUGER
JASON & NATHAN

CONSTRUCTION ACTIVITIES 7:30 CHRIS/DOUG/EPA ON-SITE. 8:00 DRILLERS ON SITE. START ON HOLE 1001-4. (OCT. 01') #4. APPROX. 15'-20' WEST OF LARGEST SUMP. SEE MAP ON REVERSE.
8:37 START DRILLING; 11:00 AM TD @ 25' W/ AGREEMENT FROM EPA

11:42 START DRILLING 1001-1 - CENTER OF POND, AGREE W/ EPA TO BURN FIRST 2'-3' OF COVER AS THAT IS OF NO INTEREST.

12:30 DRILLING STARTED ON POND ON HOLE #1. CONTINUES TO HOLES #: 3, 5, 2, 6, 7 FINISHING UP @ ABOUT 3:30 PM. ONE GOOD SHELBY TUBE COLLECTED @ #1. CHRIS LIKES IT & WANTS ONLY THAT ONE — ALL ELSE WILL BE BAG SAMPLES.

MOST HOLES ARE SIMILAR: FROM 1.5' TO 4' OF COVER, BUT USUALLY 3'. VERY SOFT DARK GREEN TO BLACK OR ORANGE TAILINGS.

CHRIS & RANDY AGREE TO MORE HOLES AS DRILLING GOES QUICKLY. SEE MAP ATTACHED.

VERBAL COMMUNICATION WITH CONTRACTOR, ENGINEER, DESIGNER, OWNER

Douglas O. Gibbs
FIELD REPRESENTATIVE

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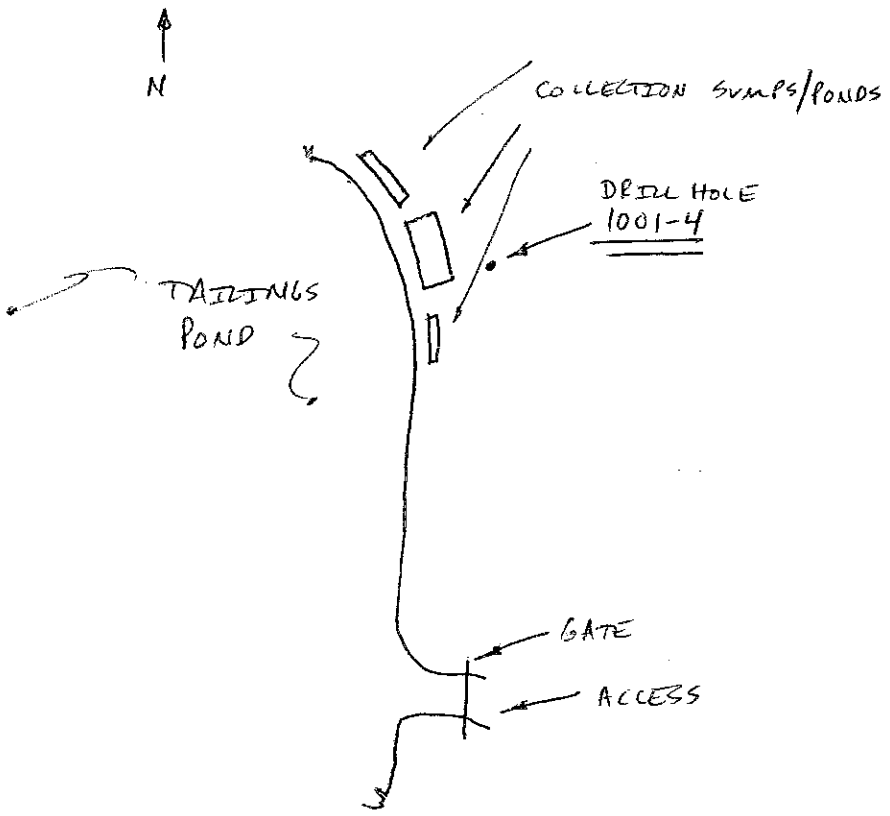
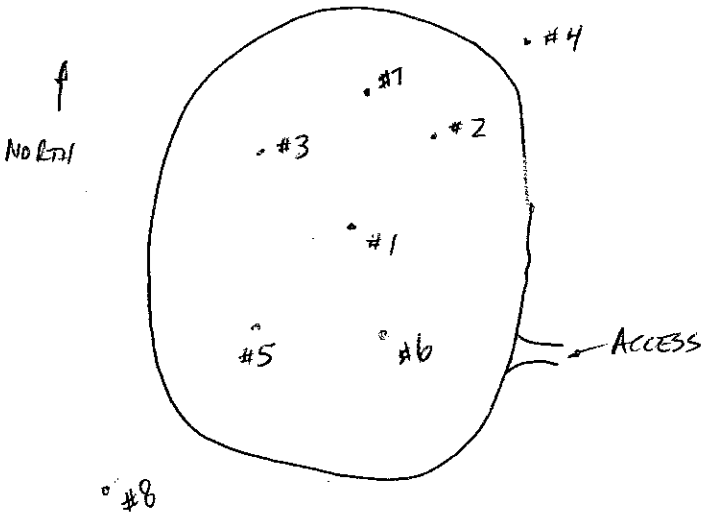

N
COLLECTION SUMPS/PONDS
DRILL HOLE
1001-4
TAILINGS
POND
GATE
ACCESS


NORTH
#4
#7
#2
#3
#1
#5
#6
ACCESS
#8

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DAILY CONSTRUCTION ACTIVITY REPORT

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
CLIENT HECLA MINING CO.
LOCATION APEX / ST. GEORGE / UMG
DAILY REPORT NUMBER 3 SHEET 1 OF 1
DATE 10/3/01

TO CHRIS GYPTON, HECLA MINING CO.

WEATHER CLEAR, WARM, DRY, 72°, AM

CONTRACTOR'S EQUIPMENT DIEDRICH D-120 HOLLOW STEM AUGER

CONSTRUCTION ACTIVITIES 8:15 START DRILLING 1001-8 NORTH OF TAILINGS POND. HOLE LOCATED 130' WEST OF EAST FENCE LINE & 13' NORTH OF NORTH FENCE LINE.

TD @ 28.2' AFTER DISCUSSIONS & AGREEMENT W/ EPA. COLLECT 4 SAMPLES TO TEST FOR ATT. LIMITS, DENSITY, GRADATION, WATER HOLDING CAPACITY.

VERBAL COMMUNICATION WITH CONTRACTOR, ENGINEER, DESIGNER, OWNER

Douglas O. Gibbs
FIELD REPRESENTATIVE

APPROVED BY

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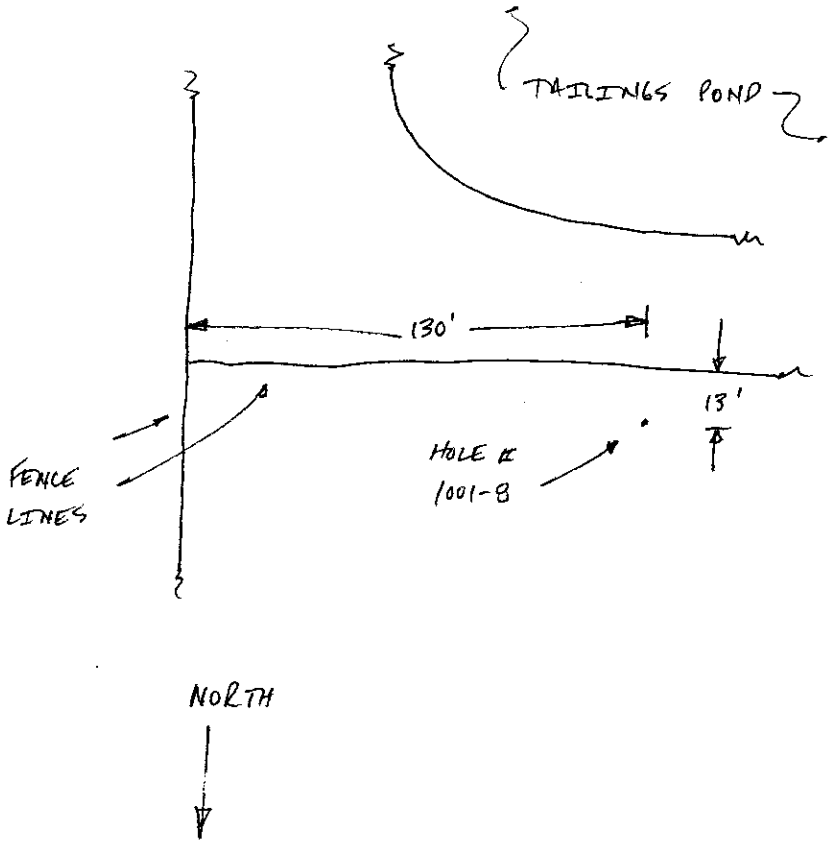
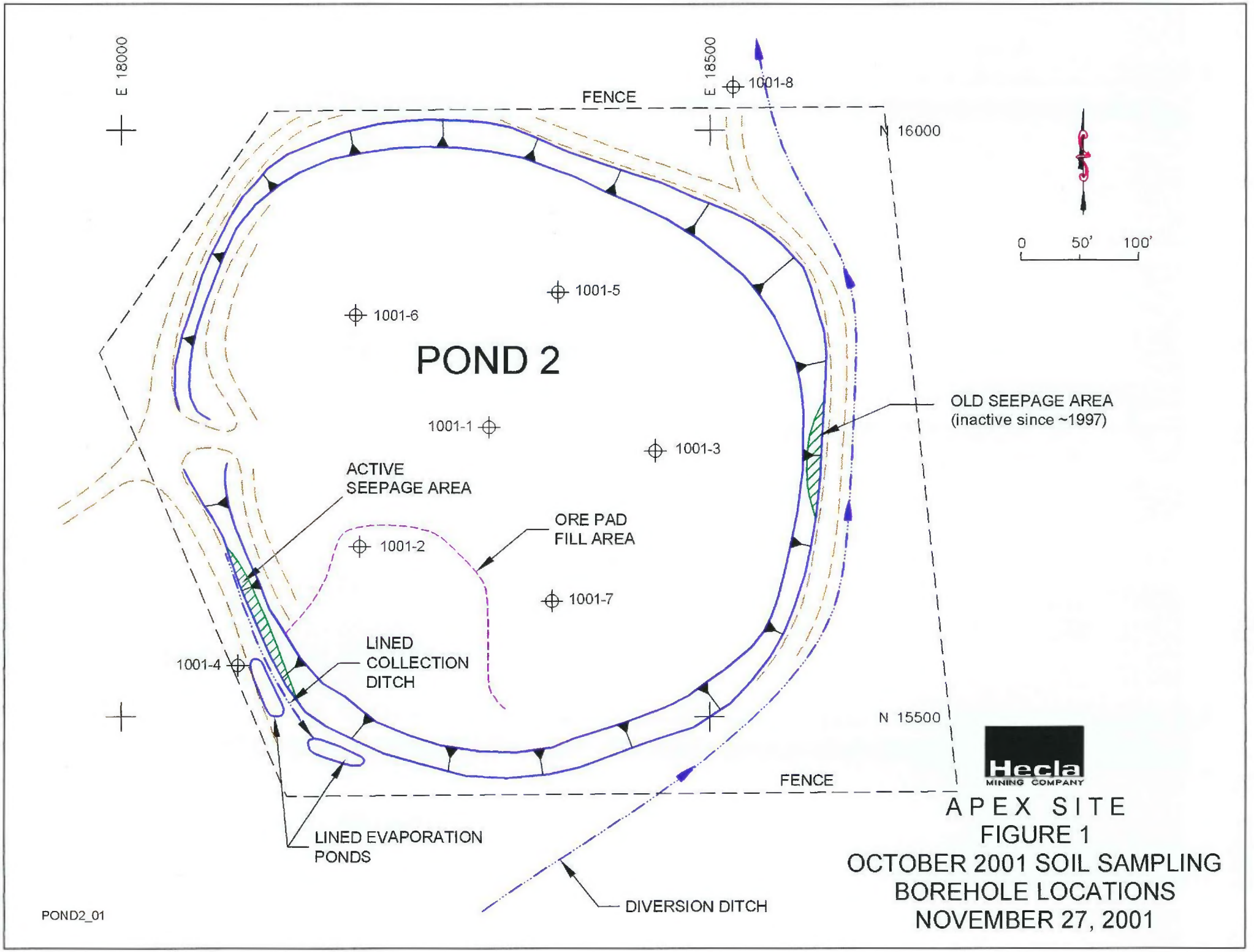
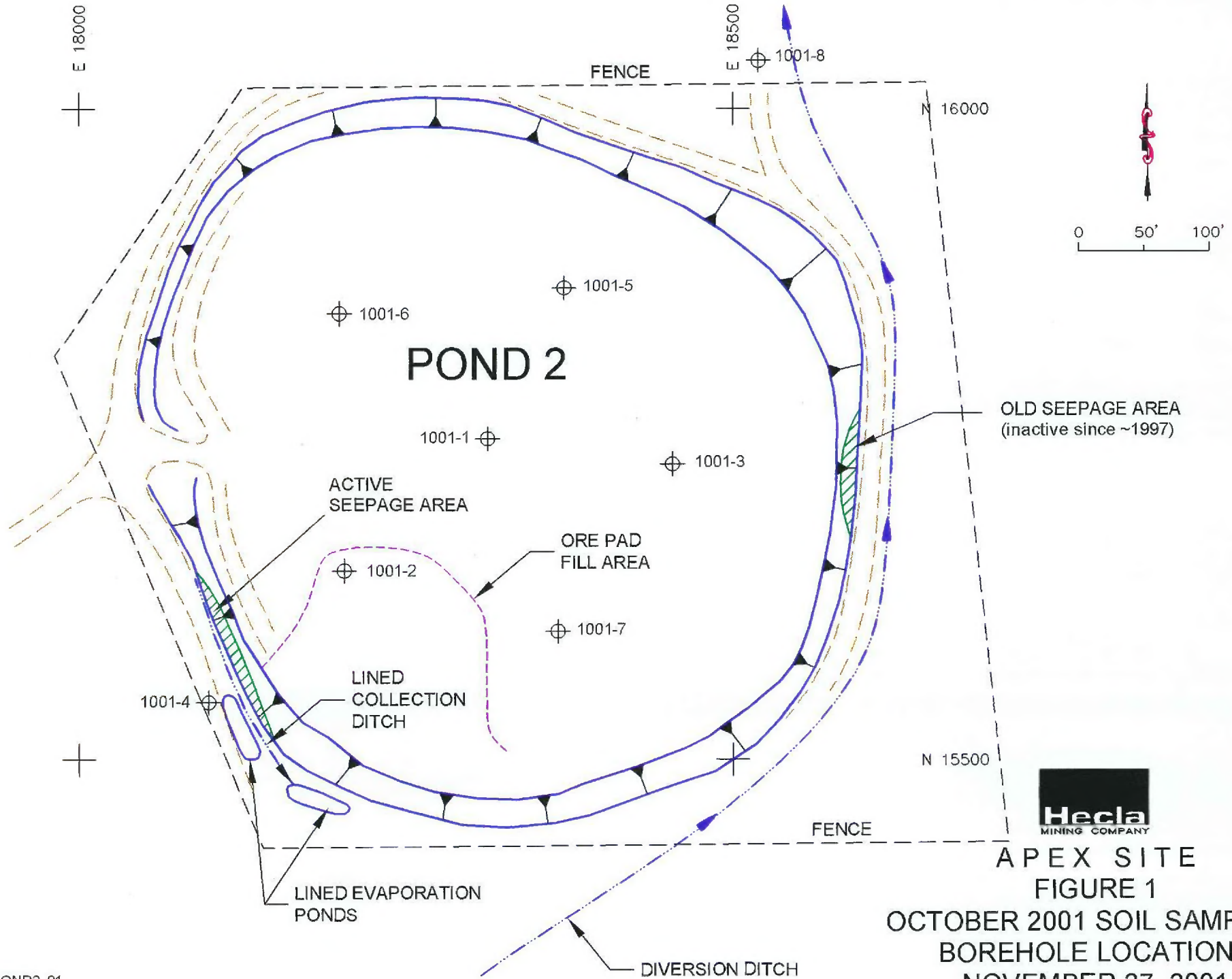
10/3/01
HECLA




E 18000
E 18500
FENCE
1001-8
N 16000
0
50'
100'
1001-5
1001-6
POND 2
1001-1
1001-3
OLD SEEPAGE AREA
(inactive since ~1997)
ACTIVE
SEEPAGE AREA
ORE PAD
FILL AREA
1001-2
1001-7
LINED
COLLECTION
DITCH
1001-4
N 15500
FENCE
LINED EVAPORATION
PONDS
DIVERSION DITCH
Hecla
MINING COMPANY
APEX SITE
FIGURE 1
OCTOBER 2001 SOIL SAMPLING
BOREHOLE LOCATIONS
NOVEMBER 27, 2001
POND2_01

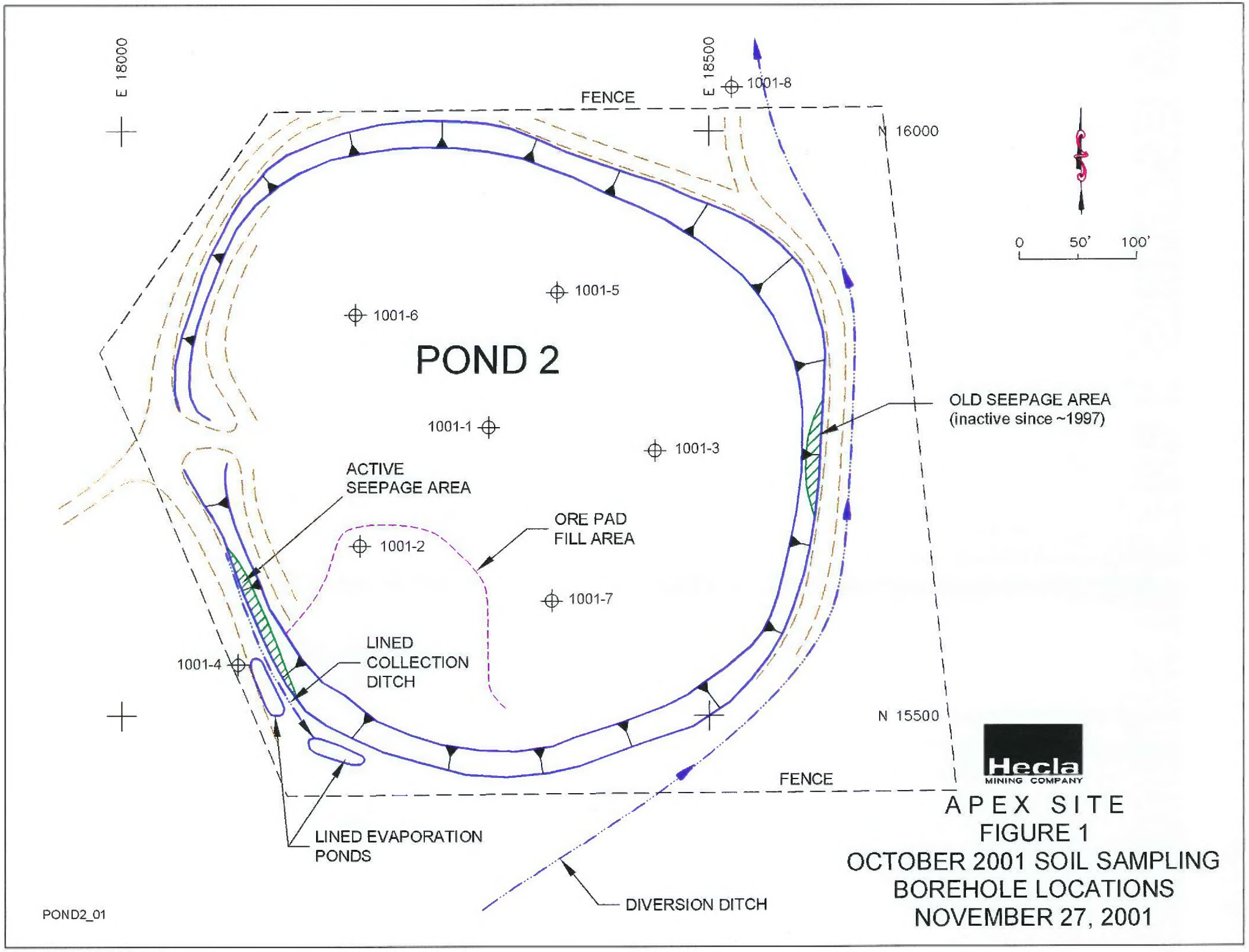


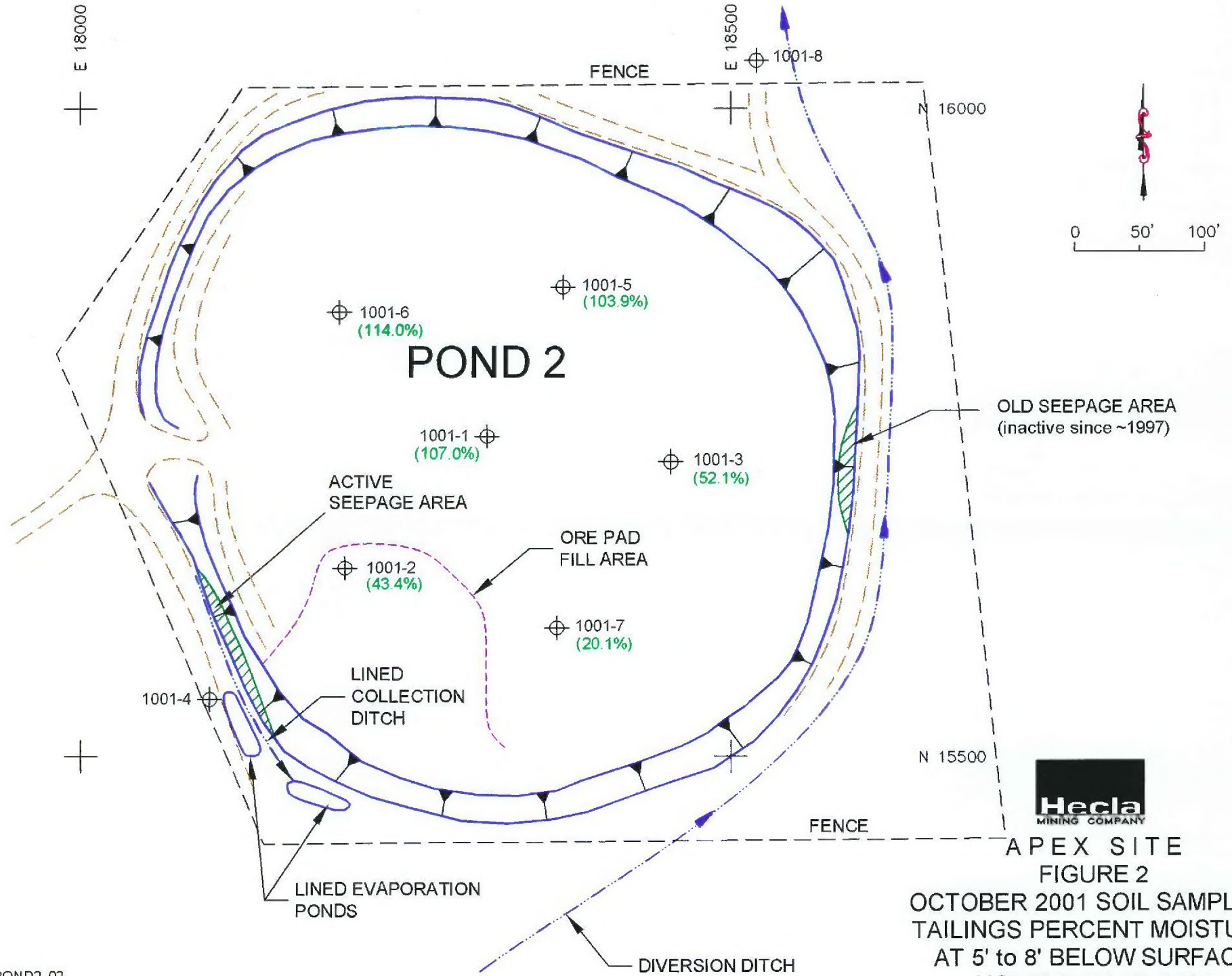
APEX SITE

FIGURE 1

OCTOBER 2001 SOIL SAMPLING
BOREHOLE LOCATIONS
NOVEMBER 27, 2001

POND2_01


E 18000
E 18500
1001-8
FENCE
N 16000
0
50'
100'
1001-5
1001-6
POND 2
1001-1
1001-3
OLD SEEPAGE AREA
(inactive since ~1997)
ACTIVE
SEEPAGE AREA
ORE PAD
FILL AREA
1001-2
1001-7
LINED
COLLECTION
DITCH
1001-4
N 15500
FENCE
LINED EVAPORATION
PONDS
DIVERSION DITCH
Hecla
MINING COMPANY
APEX SITE
FIGURE 1
OCTOBER 2001 SOIL SAMPLING
BOREHOLE LOCATIONS
NOVEMBER 27, 2001
POND2_01



APEX SITE

FIGURE 2

OCTOBER 2001 SOIL SAMPLING
TAILINGS PERCENT MOISTURE
AT 5' to 8' BELOW SURFACE
NOVEMBER 27, 2001

POND2_02

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DRILLING LOG

PROJECT APEX POND 2 SOIL SAMPL & ANALYSIS
BOREHOLE 1001-1
CLIENT HECLA MINING CO.
LOCATION ST. 6
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MTRL, SANDY GRAVEL & COBBLES
3	5	2	CAL	15/2"	1.7	5	START W/ CAL AS WE'RE STILL IN ROCK COVER MTRL TO 4.8' - SANDY GRAVEL W/ SOME CLAY @ 4.8' DK BRN TO GREEN SLIME
~~5~~ 3	~~7~~ 5	2	~~SPT~~ C	NA	NA	5	
5	7	2	ST	NA	NR	7	NO RECOVERY, LET SIT FOR 3 MINUTES TO DISSIP. P.P. - STILL WOULD NOT STAY IN TUBE
5	7	2	ST	NA	2.0	7	USED CATCHER W/ ELEC. TAPE - GOOD SAMPLE OBTAINED
7	9	2	ST	NA	NR	9	NO RECOVERY, NO CATCHER
7	9	2	ST	NA	NR	9	W/ CATCHER, NO RECOVERY, TOO WET LET SIT 2 MIN'S
7	9	2	SPT	PUSHED HAND	2.0	9	PUSHED 2' BY HAND, W/ SPT CATCHER GOOD SAMPLE, SATURATED, DK GRN TO BLK TAILS
9	10	1	SPT	" "	1.0	10	PUSHED 1' BY HAND, TO REFUSAL, LINER? GOOD SAMPLE, SAT., DK GRN TO BLACK, TAILS
							TD @ 10'
							BACKFILL TOP 4' W/ BENT. HOLE PLUG 3/8"
							DRILLER NOTED SATURATION (WATER) @ 4'
							SAMPLE @ 8.5'-9.0'
							SAMPLE @ 5.0'-7.0' SHELBY TUBE BACKFILLED W/ 3/8" HOLE PLUG

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL CALIFORNIA

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DRILLING LOG

PROJECT APEX-POND 2 SOIL SAMPL. & ANALYSIS
BOREHOLE 1001-2
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX-OMG.
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MTRL TO 1.5', TAILS, ORANGE @ 1.5'
3	5	2	CAL	3/2'	0.8	5	w/ CATCHER 0.5' TAILS ON 0.3' SAND/GRAVEL
5	6	1	SPT	PUSH	0.5	6	PUSH w/ RIG, ORANGE TO DK. BRN. SANDY TAILS SAMPLE @ 5.5'
							TD @ 6.0'

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIF.

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DRILLING LOG

PROJECT APEX POND 2 SOIL SAMPL. & ANALYSIS
BOREHOLE 1001-3
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX-OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MTRL. SANDY GRAVEL W/ COBBLES
							TAILS @ 3'
3	5	2	CAL	PUSH RIG	NR	5	CAL. W/ CATCHER
							ROCK IN HOLE
							USED SHELBY TO REMOVE ROCK
5	7	2	CAL	3/2'	2.0	7	CAL. W/ CATCHER
							GOOD SAMPLES 5.5'-6 & 6.5'-7
							BAG SAMPLES
7	8	1	SPT	HAND PUSH	NR	8	PUSHED BY HAND TO REFUSAL, NO RECOVERY
							TD @ 8.0'
							SAMPLES @:
							5.5'-6' ORANGE TO BLACK, WET TAILS
							6.5-7 ORANGE, WET, TAILS
							BACKFILL W/ 3/8" HOLE PLUG

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIFORNIA

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DRILLING LOG

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
BOREHOLE 1001-4
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX-OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 2

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION START 8:37
0	3	3	~~NA~~ C	NA	NA	~~NA~~ 3	SAND, SOME SILT, GRAVEL, ~~REFUSAL @ 4' @ BOULDER~~, DRY, NO STAINING (SW)
3	~~4.0~~ ~~4.1~~ 4.1	2	CAL	~~+50~~ NA	1.1	~~3.4~~ 4.1	REFUSAL @ 4' ON BOULDER
3	4.5	1.5	~~NA~~ C	NA	NA	4.5	AUGER TO 4.5 THROUGH ROCK, CUTTINGS DRY, CRUSHED ROCK, LT GREY (GW)
4.5	6.5	2	CAL	~50	1.7	6.5	GRAVEL TO BOULDERS, WELL GRADED, DRY, LT GREY TO BRN, NO STAINING (GW)
6.5	8.5	2	SPT	<50	2.0	8.5	~~GP~~ SM ~~GP~~ SILT & SAND, SOME CRUSHED SILT STONE, DRY TO SM, LT GREY TO BUFF, NO STAINING (SILTY SAND - SM)
4.5	8.5	4	C	NA	NA	8.5	
8.5	10	1.5	CAL	<50	1.3	10	SANDY SILT TO SILTY SAND W/ SOME GRAVEL (ML TO SM), SM, WEATHERED SILT STONE?, BUFF, NO STAINING
10	12	2	SPT	<50	2.0	12	SANDY SILT (ML), SM, LT GREY, UNIFORM, WEATHERED SILT STONE?, NO STAINING
~~10~~ 8.5	12	~~2~~ 3.5	C	NA	NA	12	SANDY SILT (SM), SM TO M, LT GREY, NP TO LP
12	14	2	CAL	~50	2.0	14	SM TO ~~15~~ 13', ROCK (GRAVEL/COBBLES) @ ~~15~~ 13', SL MOIST TO 15, DRY @ 15', GREY TO TAN, NO STAINING (SM IS WEATHERED SILT STONE)
14	16	2	SPT	>50	1.8	16	GW TO 15' DRY, GREY, SM, WEATHERED SILT STONE @ 15'; SM TO DRY, BUFF, SLIGHT, NATURAL IRON STAINING
12	16	4	C	NA	NA	16	
16	18	2	CAL	>50	2.0	18	SANDY SILT (SM) WEATHERED SILT STONE ROCK, DRY TO SM, GREY, NP, SLIGHT NAT. STAINING
18	20	2	SPT	>50		20	SAME AS ABOVE (SM) TO 19.7', CHANGE TO CLAY STONE, WEATH. RCK, DRY, DK BRN, NO STAINING (ML)

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIFORNIA

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DRILLING LOG

PROJECT APEX - POND 2 SOIL SAMPL. & ANALYSIS
BOREHOLE 1001-4
CLIENT HECLA MINING CO
LOCATION ST GEORGE/APEX - OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 2 OF 2

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
16	20	4	C	NA	NA	20	(SM) (ML)
20	22	2	CAL	+50	2.0	22	SM, GREY TO 20.5, (ML) @ 20.5 DRY, OK. BRN, NI, WEATHERED CLAYSTONE, SAME AS 19.7' TO 20'
22	24	2	SPT	+50	2.0	24	22-23 - ML, WTHRD RCK, OK. BRN., SL. MOIST 23-24 - SM, " " , GREY, SL MOIST
20	24	4	C	NA	NA	24	VERY HARD @ 23.5', BEDROCK?
24	26	2	CAL	12, 24, 21, 24 } 81	2.0	26	24-24.7 SM, GREY, SILTSTONE, DRY TO SM, WTH. RCK 24.7-25.2 FRACT. SANDST., GREY, DRY, 25.2-26 SILTSTONE (SM) TO CLAYST. (ML), DRY, OK. BRN.
26	28	2	SPT	+50	2.0	28	STRATIFIED (ML'S) LT GREY, OK BRN, SL. MOIST WEATHERED ROCK
24	25	1	C	NA	NA	25	AUGER REFUSAL @ 25', DRILLER CONCERNED BIT WILL BURN UP, DRILLING V. SLOW. EAA AGREES TO STOP
			TD @	25'			

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS

3031 banner spring ranch road, laporte, colorado 80535, 970.221-7177, 970.213.5506, monster@peakpeak.com

MONSTER ENGINEERING INC

ENGINEERING • DESIGN • MANAGEMENT

DRILLING LOG

PROJECT APEX POND 2 SOIL SAMPL. & ANALYSIS
BOREHOLE 1001-S
CLIENT HECLA MINING CO.
LOCATION ST GEORGE/APEX-OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MTRL, SANDY GRAVEL & COBBLES
3	5	2	CAL	~~BOST~~ 3/2'	1.0	5	TAILS @ ~4.0' NO SAMPLE
5	7	2	CAL	1/2'	2	7	W/ CATCHER. DK BRN TO BLK TAILS, SAT BUT NOT WET (PHOTO) GOOD SAMPLE
							TD @ 7.0'
							BACKFILL W/ 3/8" HOLE PLUG
							SAMPLE @ 6.0'-6.5'

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIFORNIA

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MONSTER ENGINEERING INC

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DRILLING LOG

PROJECT APEX - POND 2 SAMPLING & ANALYSIS
BOREHOLE 1001-6
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX - OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MATERIAL SANDY GRAVEL & COBBLES COVER TO 4.0' TO 4.5'
3	5	2	CAL	26/12"	0.3	5	COVER MTRL STUCK IN TIP, PUSHES THROUGH TAILS
5	7	2	SPT	5/12"	2.0	7	ORANGE SAND 5.0-5.5' SAMPLE @ 6.5'-7.0' DK GRN TO BLK 5.5-7 TAILS
7	9	2	SPT	13/12"	1.5	9	DK GRN TAILS TO 8.5' ORANGE SLIMY GRAVEL & SAND @ 8.5 TO 9.0'
							SAMPLE FROM 6.5' TO 7.0'
							TD @ 9.0'
							BACKFILL W/ 3/8 HOLE PLUG

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS

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MONSTER ENGINEERING INC
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DRILLING LOG

PROJECT APEX - POND 2 SAMPLING & ANALYSIS
BOREHOLE 1001-7
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX-OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/2/01 PAGE 1 OF 1

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	COVER MTRL TO 3.0 SANDY GRAVEL & COBBLES
3	4	1	CAL	6/1	0.1	4	COVER TO 4.0' AS ABOVE
4	5	1	CAL	8/2	0.4	5	COVER POUNDING DOWN TAILS, SANDY GR., WET
5	7	2	SPT	4/2	0.2	7	COVER MTRL PLUGGING SAMPLER, TAILS NOT ENTERING SAMPLER, ALMOST N.R.
5	7	4	C	NA	NA	7	
7	9	2	CAL	5/2		9	7-8 - DK GRN & BLACK TAILS, SAT 8-9' SANDY GRAVEL, ORANGE, WET SAMPLE FROM 8'-9' TD @ 9.0'

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIFORNIA

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MONSTER ENGINEERING INC

ENGINEERING • DESIGN • MANAGEMENT

DRILLING LOG

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
BOREHOLE 1001-8
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX - OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/3/01 PAGE 1 OF 2

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
0	3	3	C	NA	NA	3	WELL GRADED SANDY GRAVEL W/SILT (GW-GM), LT. BRN TO TAN, DRY
3	5	2	CAL	8/9/35/33	1.2	5	AS ABOVE W/ MORE GRAVEL & COBBLES, ROCK PLUGS BARREL @ 4.2'
5	5.5	0.5	SPT	50/5.5"	0.3	5.5	ROCK @ 5.5', GRAVEL W/ COBBLES, ROCK PLUGS ~~BARREL~~ AGAIN
3	10	7.0	C	[illegible]	NR	10	CUTTINGS: GREY TO BUFF, CRUSHED ROCK, ~~SANDSTONE~~ SILTSTONE?, DRY, V. HARD, SANDSTONE?
10	11	1.0	CAL	45/55	0.1	11	ROCK PLUGGED SAMPLE BARREL
10	12	2.0	C	NA	NA	12	CUTTINGS, BUFF CRUSHED ROCK, SILTSTONE, DRY V. SILTY IN CRUSHED ~~ROCK~~ FORM.
12	14	2.0	SPT	13/26/29/32	1.3	14	CRUSHED ROCK, DRY, LT GREY TO BRN., SANDSTONE?
12	14	2.0	C	NA	NA	14	SAME AS CUTTINGS FROM 10-12'
14	16	2.0	~~SPT~~ CAL	12/16/15/24	0.6	16	CRUSHED LIMESTONE BLOCKS SAMPLER
16	18	2.0	SPT	20/18/20/25	1.2	18	CRUSHED ROCK, 1 LAYER 0.4' OF DECOMPOSED ROCK SL. MOIST, LT BRN TO BRN, MOTTLED
14	18	4.0	C	NA	NA	18	CUTTINGS HAVE SLIGHT MOISTURE, MORE BROWN
18	20	2.0	CAL &	19/18/22/NA 13	1.2 NA	20	~~CUTTINGS HAVE SLIGHT MOISTURE, MORE BROWN~~ SAMPLE @ 19', 0.8' LAYER WEATHERED ROCK, BRN SL. MOIST, SILTY SAND W/ GRAVEL SM
20	22	2.0	~~SPT~~ CAL	18/18/17/16	1.4	22	CRUSHED WEATHERED ROCK, WELL GRADED SAND W/ GRAVEL (SW-SM), LT BRN TO BRN, SL. MOIST.
22	24	2.0	SPT	<50	1.4	24	LEAN CLAY W/ SAND (CL), ~~LT~~ DRK BRN TO RED BRN., SL MOIST (@ PI), LOW PL., SAMPLE @ 24'

*SPT - SPLIT SPOON (1 3/8" ID) ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS CAL - CALIFORNIA (2" ID)

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MONSTER ENGINEERING INC

ENGINEERING • DESIGN • MANAGEMENT

DRILLING LOG

PROJECT APEX - POND 2 SOIL SAMPLING & ANALYSIS
BOREHOLE 1001-B
CLIENT HECLA MINING CO.
LOCATION ST. GEORGE/APEX-OMG
DRILLING METHOD HOLLOW STEM AUGER
DATE 10/3/01 PAGE 2 OF 2

DEPTH (FT) FROM	DEPTH (FT) TO	RUN (FT)	SAMPLE TYPE*	BLOWS N	REC. (FT)	DEPTH (FT)	DESCRIPTION
18	20	2.0	C	NA	NA	20	
20	24	4.0	C	NA	NA	24	CUTTINGS, BRN, SL MOIST, LOW PLASTIC CLAY w/ SAND (CL)
24	26	2.0	CAL	6/6/8/11	1.8	26	SAMPLE @ 24' LOW PLASTIC CLAY w/ SL. SAND (CL), MOIST TO SL. MOIST, BRN TO 25' @ 25'-26" LT GLEY, NP SILT, NO SAND, MOIST TO SL. MOIST TO LT. BLUE
26	28	2.0	SPT	9/11/14/28	2.0	28	LT. GREY N.P. SILT GRADES TO WEATHERED SILT-STONE @ 28', S. MOIST, DECOMPOSED ROCK TO LT. BLUE SAMPLES @ 25' & 26'
24	28	4.0	C	NA	NA	28	NO CUTTINGS
28	28.2	0.2	CAL	50/3"	0.2	28.2	HARD ROCK @ 28.2, LT GREY TO LT BLUE SILT-STONE. REFUSAL ~~35~~ 50/3".
							TD @ 28.2'
							SAMPLE DEPTHS: 19', 24', 25', 26'
							NOTE: TEST FOR ATT. LIMITS, WATER HOLDING CAPACITY, BULK DENSITY, MOISTURE, GRAIN SIZE DISTRIBUTION
							MAP (SEE BACK)

*SPT - SPLIT SPOON ST - SHELBY TUBE DC - DRY CORE C - CUTTINGS

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S T R A T A
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-1 at 5.0' - 7.0'
Sample Number:	1
Description:	Brown/Red Silty Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
No. 100	100
No. 200	99.3

Specific Gravity =		3.58	(ASTM D-854)
As Received Moisture Content =		107.0%	(ASTM D-2116)
In-Place Dry Density =		43.0 pcf	(ASTM D-2937)
Atterberg Limits:	Liquid Limit =	83	(ASTM D-4318)
	Plastic Limit =	31	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

STRATA
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-1 at 8.5' – 9.0'
Sample Number:	2
Description:	Red/Black Silty Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
3/8"	100
No. 4	98
No. 8	98
No. 16	97
No. 30	97
No. 50	97
No. 100	96
No. 200	93.6

Specific Gravity =		3.73	(ASTM D-854)
As Received Moisture Content =		115.7%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	76	(ASTM D-4318)
	Plastic Limit =	21	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

STRATA
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
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November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-2 at 5.5'
Sample Number:	3
Description:	Red Silty Sand (SM)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
No. 16	100
No. 30	98
No. 50	94
No. 100	69
No. 200	46.7

Specific Gravity =		3.35	(ASTM D-854)
As Received Moisture Content =		43.4%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	Non-Obtainable	(ASTM D-4318)
	Plastic Limit =	NP	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

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GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
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November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-3 at 5.5' - 6.0'
Sample Number:	4
Description:	Red/Orange Sandy Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
½"	100
3/8"	94
No. 4	90
No. 8	89
No. 16	87
No. 30	85
No. 50	83
No. 100	76
No. 200	66.1

Specific Gravity =		3.03	(ASTM D-854)
As Received Moisture Content =		52.1%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	54	(ASTM D-4318)
	Plastic Limit =	10	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

STRATA
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
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November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-3 at 6.5' – 7.0'
Sample Number:	5
Description:	Red/Orange Sandy Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
½"	100
3/8"	86
No. 4	85
No. 8	84
No. 16	82
No. 30	81
No. 50	81
No. 100	78
No. 200	72.5

Specific Gravity =		3.38	(ASTM D-854)
As Received Moisture Content =		61.8%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	54	(ASTM D-4318)
	Plastic Limit =	9	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

STRATA
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
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November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-5 at 6.0' – 6.5'
Sample Number:	6
Description:	Brown/Black Silty Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
No. 100	100
No. 200	98.5

Specific Gravity =		3.39	(ASTM D-854)
As Received Moisture Content =		103.9%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	82	(ASTM D-4318)
	Plastic Limit =	30	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

S T R A T A
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-6 at 6.5' - 7.0'
Sample Number:	7
Description:	Green/Black Silty Clay (MH or OH)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
No. 50	100
No. 100	98
No. 200	96.3

Specific Gravity =		3.33	(ASTM D-854)
As Received Moisture Content =		114.0%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	84	(ASTM D-4318)
	Plastic Limit =	34	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

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GEOTECHNICAL ENGINEERING & MATERIALS TESTING
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208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project:	Apex Pond 2 Soil Analysis
Date Received:	October 5, 2001
Boring No./Depth:	1001-7 at 8.0' - 9.0'
Sample Number:	8
Description:	Red Orange Clayey Sand (SC)

Sieve Analysis (ASTM C-136)

Sieve Size	Percent Passing
¾"	100
½"	86
3/8"	80
No. 4	66
No. 8	57
No. 16	51
No. 30	48
No. 50	46
No. 100	42
No. 200	36.1

Specific Gravity =		3.11	(ASTM D-854)
As Received Moisture Content =		20.1%	(ASTM D-2116)
Atterberg Limits:	Liquid Limit =	27	(ASTM D-4318)
	Plastic Limit =	8	

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

S T R a T a
GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

Project: Apex Pond 2 Soil Analysis
Date Received: October 5, 2001

Boring No./Depth:	1001-8 at 19.0'		
Sample Number:	9		
Specific Gravity =		2.63	(ASTM D-854)
As Received Moisture Content =		9.3%	(ASTM D-2116)
In-Place Dry Density =		118.1 pcf wax coated	(ASTM D-2937)

Boring No./Depth:	1001-8 at 24.0'		
Sample Number:	10		
Specific Gravity =		2.63	(ASTM D-854)
As Received Moisture Content =		13.0%	(ASTM D-2116)
In-Place Dry Density =		113.9 pcf wax coated	(ASTM D-2937)

Boring No./Depth:	1001-8 at 25.0'		
Sample Number:	11		
Specific Gravity =		2.70	(ASTM D-854)
As Received Moisture Content =		15.2%	(ASTM D-2116)
In-Place Dry Density =		115.1 pcf wax coated	(ASTM D-2937)

Boring No./Depth:	1001-8 at 26.0'		
Sample Number:	12		
Specific Gravity =		2.68	(ASTM D-854)
As Received Moisture Content =		21.5%	(ASTM D-2116)
In-Place Dry Density =		116.5 pcf wax coated	(ASTM D-2937)

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

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GEOTECHNICAL ENGINEERING & MATERIALS TESTING
W. 280 Prairie Avenue, Coeur d'Alene, Idaho 83815
208 772-2428 / Fax 208 772-9968

November 14, 2001
Client No.: HECM02
Project No.: S010168-1

Mr. Chris Gypton
Hecla Mining Company
6500 Mineral Drive
Coeur d'Alene ID 83815-8788

RE: **Remolded Permeability for Apex Pond #2**
Description: Brown/Red Silty Clay (MH or OH)

Dear Mr. Gypton:

STRATA has completed testing on the sample delivered to our laboratory October 5, 2001 from the in place material on Apex Pond #2. Following are the test results.

The sample was remolded in three lifts and consolidated by rodding each lift ten times with a 5/8" diameter rod.

The results of the Falling Head Permeability are as follows:

Method: ASTM D5856 (Falling Head)
Packing Dry Density: 43.0 pcf
Packing Moisture Content: 107.0 %
*Moisture Content after Test: 75.5%
Coefficient of Permeability: 3.7×10^{-6} cm/sec

* It is the opinion of STRATA that consolidation occurred during saturation period of test.

Note: The above data was obtained under laboratory conditions and may not exactly reflect actual field permeability. If you have any questions or require additional information, please do not hesitate to call.

Thank you,
STRATA, Inc.

Chris McKissen
Laboratory Supervisor

CAPILLARY-MOISTURE RELATIONS

Apex Pond 2, Sample # 9

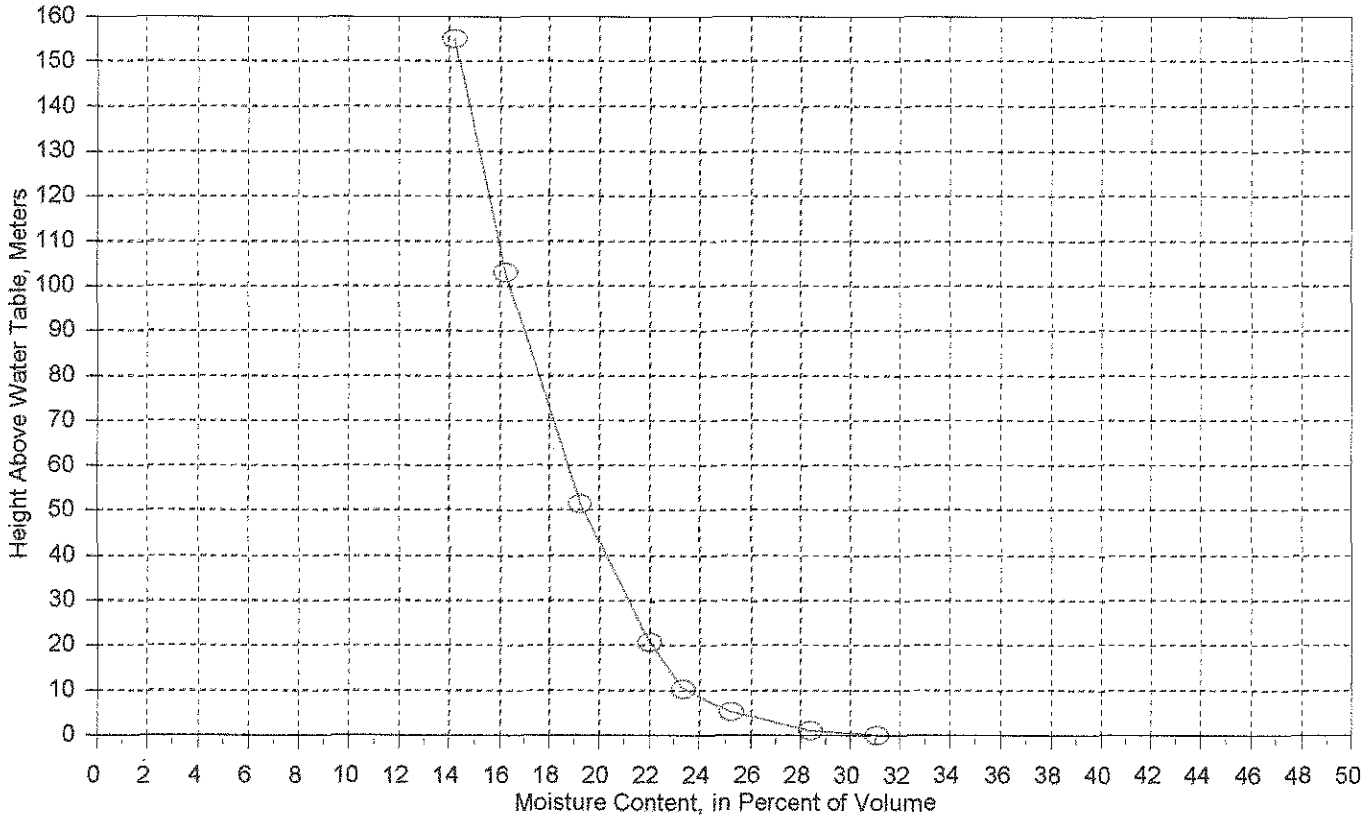

TABLE CAPILLARY-MOISTURE
Strata Inc., APEX Pond 2
Sample # 9

Height m		0	1.03	5.17	10.3	20.6	51.5	103	155
Atm. bar		0	0.1	0.5	1	2	5	10	15
(3)	42.8	44.49	43.94	43.29	42.9	42.62	42.05	41.43	41.02
(5)	4.71	6.4	5.85	5.2	4.81	4.53	3.96	3.34	2.93
(7)	38.09	38.09	38.09	38.09	38.09	38.09	38.09	38.09	38.09
(8)	12.37	16.80	15.36	13.65	12.63	11.89	10.40	8.77	7.69
(9)	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
(10)	22.87	31.07	28.40	25.24	23.35	21.99	19.22	16.21	14.22

KEY:
( ) Refer to ASTM D 3152
(3) Weight of wet sample, g
(5) Weight of moisture, g
(7) Weight of dry sample,g
(8) Moisture content (5/7*100)
(9) Unit weight of dry sample, g/cc
(10) Moisture content volume percent (8*9)
laboratory ref. 34

CAPILLARY-MOISTURE RELATIONS

Apex Pond 2, Sample # 10

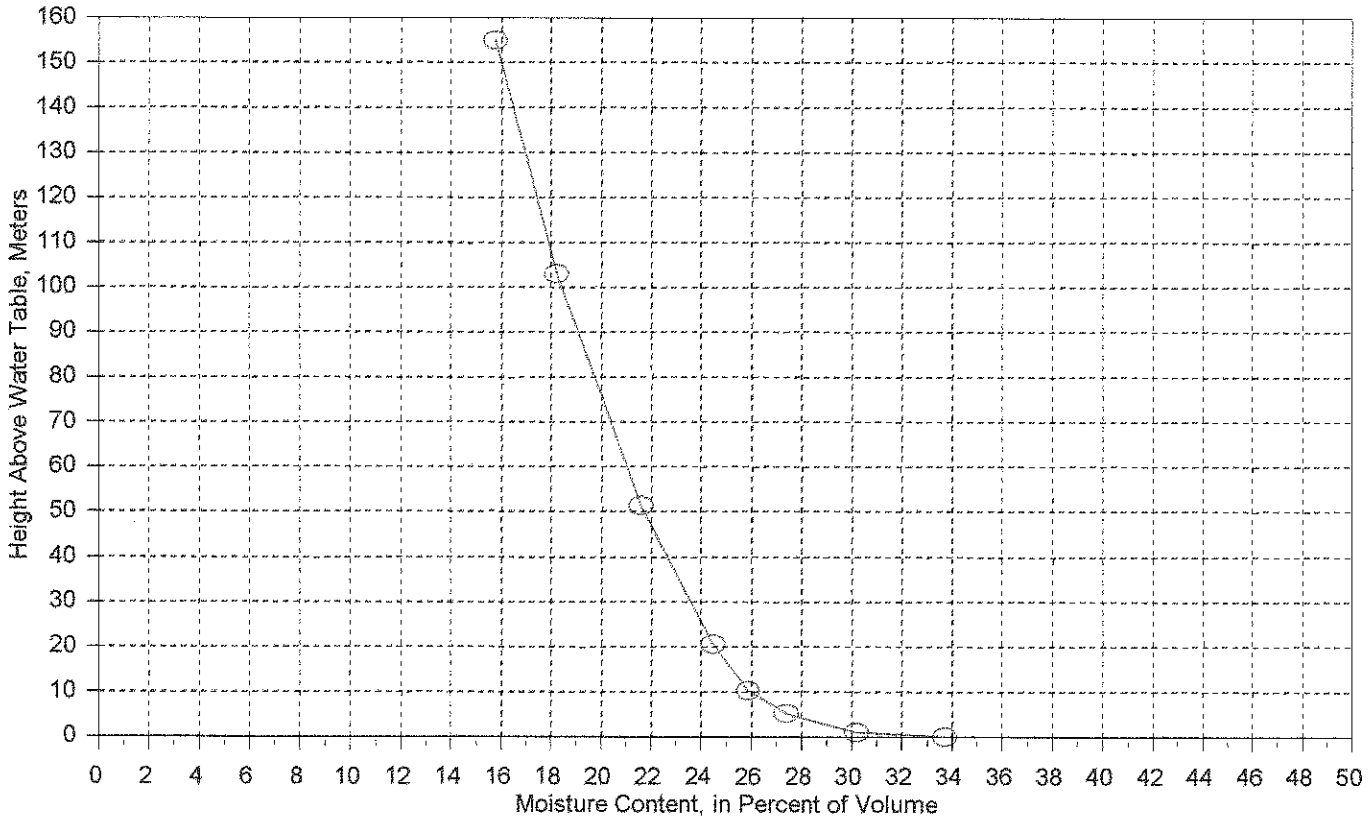

TABLE CAPILLARY-MOISTURE
Strata Inc., APEX Pond 2
Sample # 10

Height m		0	1.03	5.17	10.3	20.6	51.5	103	155
Atm. bar		0	0.1	0.5	1	2	5	10	15
(3)	42.7	44.19	43.47	42.89	42.58	42.29	41.7	41	40.49
(5)	5.45	6.94	6.22	5.64	5.33	5.04	4.45	3.75	3.24
(7)	37.25	37.25	37.25	37.25	37.25	37.25	37.25	37.25	37.25
(8)	14.63	18.63	16.70	15.14	14.31	13.53	11.95	10.07	8.70
(9)	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81
(10)	26.46	33.69	30.20	27.38	25.88	24.47	21.60	18.21	15.73

KEY:
( ) Refer to ASTM D 3152
(3) Weight of wet sample, g
(5) Weight of moisture, g
(7) Weight of dry sample,g
(8) Moisture content (5/7*100)
(9) Unit weight of dry sample, g/cc
(10) Moisture content volume percent (8*9)
laboratory ref. 23

CAPILLARY-MOISTURE RELATIONS

Apex Pond 2, Sample # 11

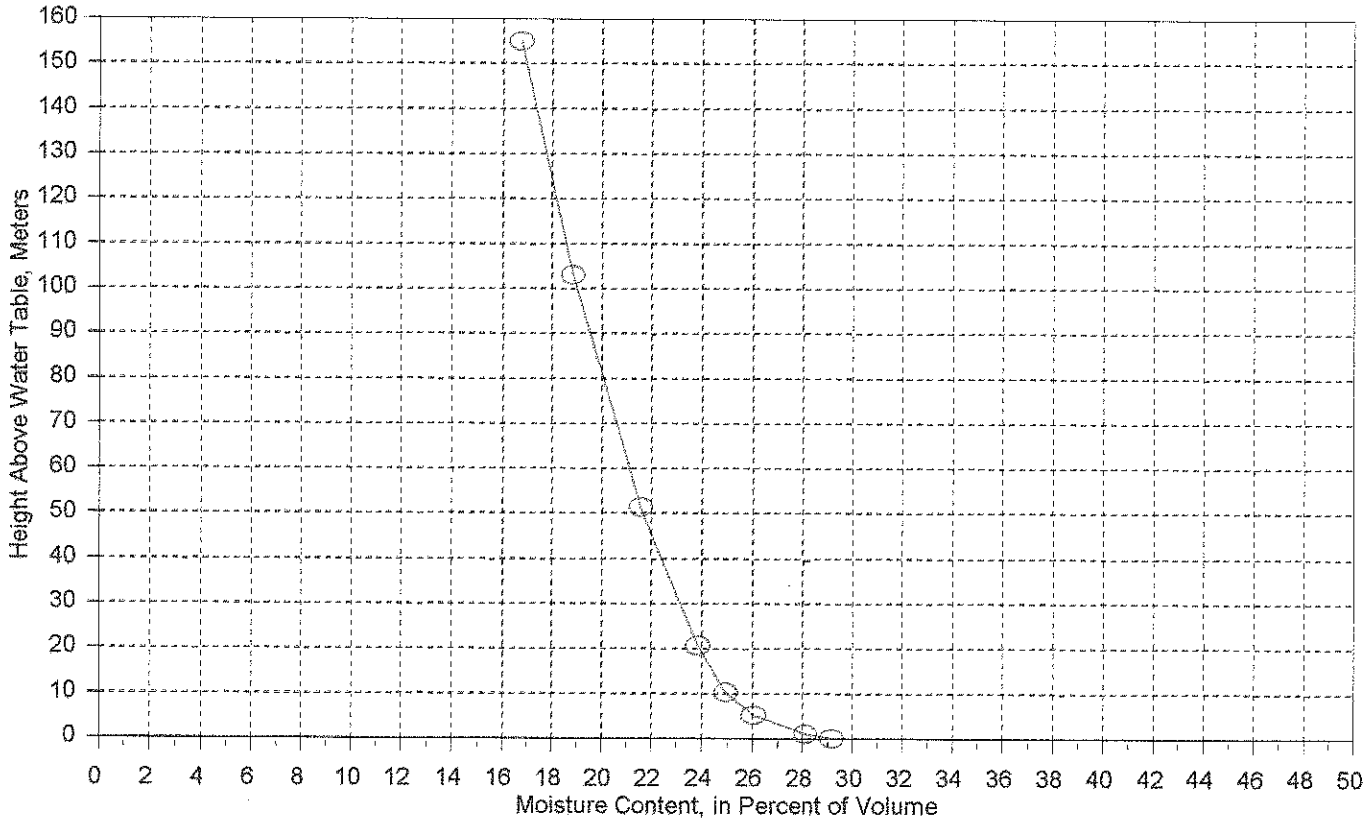

TABLE CAPILLARY-MOISTURE
Strata Inc., APEX Pond 2
Sample # 11

Height m		0	1.03	5.17	10.3	20.6	51.5	103	155
Atm. bar		0	0.1	0.5	1	2	5	10	15
(3)	43.67	44.31	44.1	43.67	43.44	43.21	42.74	42.18	41.75
(5)	5.37	6.01	5.8	5.37	5.14	4.91	4.44	3.88	3.45
(7)	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3
(8)	14.02	15.69	15.14	14.02	13.42	12.82	11.59	10.13	9.01
(9)	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86
(10)	26.07	29.18	28.16	26.07	24.95	23.84	21.56	18.84	16.75

KEY:
( ) Refer to ASTM D 3152
(3) Weight of wet sample, g
(5) Weight of moisture, g
(7) Weight of dry sample,g
(8) Moisture content (5/7*100)
(9) Unit weight of dry sample, g/cc
(10) Moisture content volume percent (8*9)
laboratory ref. 2

CAPILLARY-MOISTURE RELATIONS

Apex Pond 2, Sample # 12

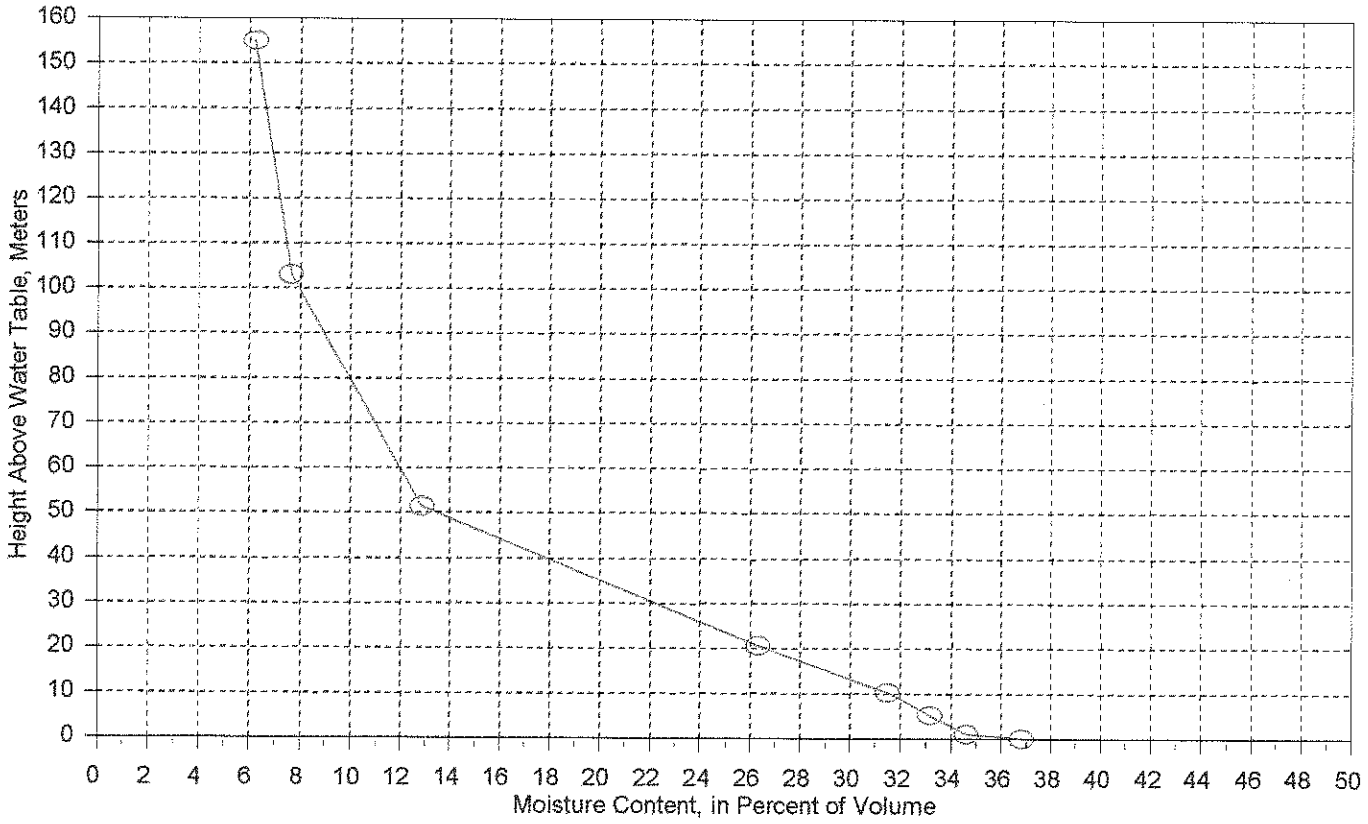

TABLE CAPILLARY-MOISTURE
Strata Inc., APEX Pond 2
Sample # 12

Height m		0	1.03	5.17	10.3	20.6	51.5	103	155
Atm. bar		0	0.1	0.5	1	2	5	10	15
(3)	46.04	45.56	45.1	44.8	44.46	43.39	40.62	39.54	39.25
(5)	8.07	7.59	7.13	6.83	6.49	5.42	2.65	1.57	1.28
(7)	37.97	37.97	37.97	37.97	37.97	37.97	37.97	37.97	37.97
(8)	21.25	19.99	18.78	17.99	17.09	14.27	6.98	4.13	3.37
(9)	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84
(10)	39.18	36.85	34.61	33.16	31.51	26.31	12.87	7.62	6.21

KEY:
( ) Refer to ASTM D 3152
(3) Weight of wet sample, g
(5) Weight of moisture, g
(7) Weight of dry sample,g
(8) Moisture content (5/7*100)
(9) Unit weight of dry sample, g/cc
(10) Moisture content volume percent (8*9)
laboratory ref. 42